THE TEN-YEAR CYCLE

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Illustrations by the author

Cover—HUNGARIAN PARTRIDGES
after an original drawing by Wm. Rowan

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Outstanding Problem of Canadian Conservation

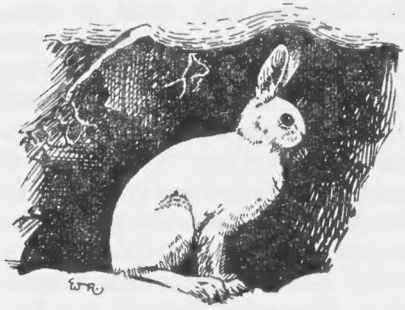
by

WILLIAM ROWAN

This pamphlet has been prepared for the information of Alberta sportsmen at a moment when the periodic fluctuations of certain game birds are much in the spotlight and seasons and bag limits in constant debate. The original printing being exhausted, the second edition herewith has been enlarged and revised. The immaturity of the subject will doubtless make further revisions necessary. The author hopes that criticism, comment and contribution of new facts and records will continue to be received as an outcome of this attempt to summarize (primarily for Alberta) this very important phase of Canadian conservation.

It has long been common knowledge among country residents of the Canadian north that the numbers of rabbits, resident game birds and many fur-bearing mammals show conspicuous fluctuations at rather regular intervals. The interval from peak to peak is widely believed to be 7 years yet the supposition is a fallacy, for the correct period is much nearer 10. The evidence is provided in the following pages.

The "ten-year" cycle has again become impressed on Canadian sportsmen within the past few years, thanks to the almost total disappearance of upland game birds in 1943 and the inevitable cessation of hunting thereafter. To the fur trade the cycle has been familiar for over 200 years, evidenced in fluctuating supply and financial returns. Yet the chief actor in this ten-year drama is neither fur-bearer nor fowl, but the common rabbit of the northern woodlands and muskegs, known to scientists as *Lepus americanus*.



Snowshoe Rabbit
(Winter)

Its most popular name is snowshoe rabbit, but it is in actual fact a hare; it is also commonly called the varying hare because of changes from brown to white in the fall and back again in the spring. In distribution it covers the whole of Canada (excepting only a strip of mountains in the west and a strip of barrens along the arctic coast) as well as the northern tier of the United States.

The ubiquitous snowshoe rabbit is of peculiar significance because it provides—and is—the staple food item for a great

variety of other animals. Thanks to its wide distribution and that characteristic fecundity that has made rabbits a universal by-word in the matter of propagation, it provides an almost unlimited meat supply across the Dominion. There is only one complaint—the supply is periodic. Here today and gone tomorrow: —millions one year and none the next, this is a most unfortunate state of affairs for the conservationists who would prefer to see a constant and dependable supply of rabbits year in and year out, for with that requirement fulfilled, the fur trade, one of Canada's primary industries, would automatically become stabilized. As it is, much of the catch comes to be periodic, an inevitable outcome of the periodicity of rabbits. Little wonder that the cycle has not only aroused the trader's curiosity but has also exercised his patience through the two centuries with which he has been familiar with it, or that he should consider it the outstanding problem of Canadian conservation.

It is probable that all animal populations fluctuate. Certain it is that the large ungulates of Africa and elsewhere, lemmings in Scandinavia and our own North-West Territories, mice in practically all parts of the world, fishes in the streams and oceans, locusts on the deserts or tent-caterpillars in the forests all show marked variations in numbers over the years. These fluctuations, however, as far as they are understood today, show much disparity in their incidence; whereas the most striking single feature of the Canadian rabbit cycle is its regularity, for it comes and goes at approximately ten-year intervals. The records of the Hudson's Bay Company, going back over 200 years, reveal the more exact average period to be 9.6 years.

Seton has estimated that at times of peak there may be a population of bunnies throughout the suitable country of the Canadian north of 10 to the acre or 6,000 to the square mile and a possible provincial population of 100,000,000 rabbits. The heaviest concentration of rabbits of which the writer has a record is an estimated 10,000 on 1½ acres of land. This was local and possibly unique but reflects the prodigious numbers that rabbits can attain. When one considers this stupendous climax in light of the fact that a vast host of predatory animals—from hawks and owls to most fur-bearing mammals—have been feasting and fattening for years on rabbits, their own numbers

Snowshoe Rabbit (Summer)

steadily swelling in a land of temporarily unlimited supply, the rabbit hordes become the more remarkable. It looks as though nothing could stay the rising tide of rabbits.

But rabbits have not got the stage to themselves, for certain other resident animals show the same phenomenon, an inordinate increase in numbers over a period of years, to culminate finally in a peak together with the rabbits. The most celebrated members of this cycling fraternity include (besides rabbits) practically all the members of the grouse family, the Hungarian partridge, probably the pheasant, the magpie, almost certainly evening grosbeak and bluejay, as well as the majority of fur-bearers, although the peaks of the latter do not synchronize with those of the rabbit but typically follow a year later (or several years with some species). A large proportion of the resident northern animal population thus shows a regular rhythm of abundance with peaks at approximately ten-year intervals. Although the crash appears to hit first in the north, and later in the south, it must be considered a single phenomenon across the Dominion in the over-all viewpoint. There may be a local lag or advance of a year in some districts but such figures as Snyder's reveal the correct perspective when he records the peak-years of the sharp-tailed grouse across the continent during the thirties as follows: British Columbia, 1931-3; Alaska, 1932; Alberta, 1932-3; Saskatchewan, 1932; Manitoba, 1932-3; W. Ontario, 1932-3; N. and S. Ontario, 1932-3. (L. L. Snyder, A Study of the Sharp-tailed Grouse: 1935, University of Toronto Press.) These were also rabbit years. During the past four years there has been a simultaneous reduction of pheasants over the whole continent in both Canada and the United States, while the numbers of the entire cycling fraternity are today fast recovering and at about the same stage over the whole Dominion.

A complication is introduced into this picture through the fact that mice, voles, lemmings and shrews apparently have a four-year cycle of their own. Animals like the fox and snowy owl, that depend largely on mice for subsistence but also to some extent on rabbits, as a result show the ten-year peak in much modified form. The lynx, on the other hand, which eats rabbits almost exclusively, exhibits the most striking and regular periodicity of all the fur-bearers, a fact well brought out by Elton and Nicholson. The lynx cycle, when plotted on paper, is almost as even in its incidence as a mathematician might plot it with calipers, as the accompanying graph which covers 112 years, strikingly illustrates. (From Charles Elton and Mary Nicholson, "The Ten-Year Cycle in Numbers of the Lynx in Canada", *Journal of Animal Ecology,* Vol. 11, No. 2, pp. 215-44, Nov. 1942.)

The graph is of particular interest: (a) because it fixes the dates of lynx maxima and minima with unusual precision through a

laborious analysis of all Hudson's Bay Company and other fur-catch records over the years involved; (b) because the peaks and depressions of the lynx coincide very closely with those of the snowshoe hares and so indirectly give us a reliable rabbit chart.

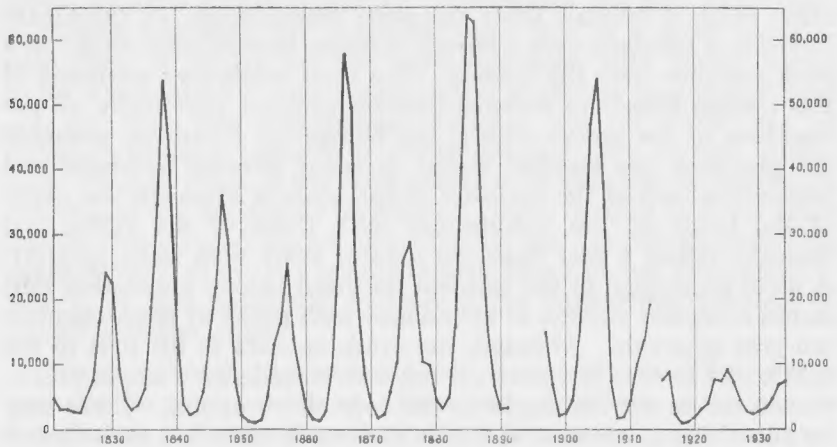


Fig. 7—Lynx fur returns of the Northern Department, Hudson's Bay Co., 1821-1913, and of equivalent area 1915-34

Quite apart from the fallibility of human memory, past maxima and minima are difficult to date since they are rarely clear-cut and do not necessarily coincide in all localities. Of the following dates the first three are combinations of the recollections of early settlers and "old-timers", while the last three depend on direct observation: they represent grouse and rabbit maxima for central Alberta and may be accepted as, at least, reasonable approximations. They are:

1896; 1905-6; 1915; 1924-5;; 1933-4; 1942.

From the nature of the case, forecasts cannot be made with certainty, but it is a justifiable expectation that the current cycle should culminate at about 1952.

Let us look at the rise and fall of a single cycle as seen in western Canada, the selected zone being the Edmonton district of the Province of Alberta. By that I mean approximately Longitude 113 and Latitude 53 and the territory immediately north, south, east and west of their crossing point. The country here is arable with farmlands getting rapidly sparser to the north and west, till one finds oneself in a limitless wilderness of parkland, coniferous forest, lake and muskeg. Here hunting pressure is light, only occasional trappers eke out a living and the animal population is not seriously disturbed.

In 1942 rabbits had attained a peak. They were so numerous that even within the city limits of sprawling Edmonton (with a population of about 110,000) rabbits could periodically be seen

scuttling out of the way of cars right in town or chased by dogs across vacant lots. Almost wherever one cared to take a country walk, rabbits were incessantly encountered, small trees were denuded of their bark while the snow, in winter time and on favoured spots, was trampled flat and hard by innumerable rabbits.

In 1942 farmer Bill Schmidt of Fawcett, Alberta, exterminated his cat on account of the surfeit of rabbits. The cat had produced a litter of kittens in the horse barn and apparently decided to rear them on rabbits. She would bring in anything up to 20 per day and deposit them all over the floor for men and horses to slither on till the situation became intolerable. When a cat can kill up to 20 rabbits daily the supply may certainly be deemed unlimited!

In 1942 nearly six million rabbit skins were shipped to felt and hat manufacturers of the United States from Alberta's northland, a kill that was barely enough to scratch the surface of the hare population. Yet, such is the nature of the crash, that in the year that followed (1943), contracts had to be cancelled and shipments discontinued for lack of rabbits. (The upland bird crash seems to be less precipitate than that of rabbits.)

At their peak years rabbits present a serious problem to both foresters and agriculturists. They may do irreparable damage under the right circumstances and in any event appear to create a cycle of germination and growth in certain species of trees in the wild. Mice, at their peaks, may do analogous damage on a lesser scale, but we are not concerned with them here.

In 1942 sharp-tailed grouse had also attained a peak. Throughout the wilderness north of Edmonton they were to be found in myriads, while even in the south of the Province, rather second-rate chicken country, they were plentiful. A hundred miles north of Edmonton that fall my son, Julian, and I estimated a single aggregation in a wheat field at 1,500 birds, while flocks of a thousand and over were reported many times by observers from the north.

Sharptailed Grouse

But far vaster numbers that this have been noted on occasion. For instance, during one of the years immediately preceding the great peak of 1925—the precise year is uncertain—Mr. W. F. H. Mason of Edmonton and a friend, hunting in the Chip Lake district about 80 miles to the west, witnessed a remarkable passage of sharp-tails. For approximately half an hour flocks numbering from 20 to 50 birds passed by in a more or less continuous stream, travelling south-east. As far as the observers

could see, more flocks kept coming: there must have been tens of thousands of birds. A similar flight was witnessed during one of these same years by Mr. Ted Omand, a few miles out of Edmonton.

In 1942 ruffed grouse, too, had apparently reached saturation point. The shooting season was open for the whole month of October and the weather remained fine, with the roads dry and motoring at its best. On a favorite ruffed grouse beat 30 miles out of Edmonton there had been an almost continuous stream of hunters, yet on the last day of the season when my boy and I took a special trip to the area to see how the birds had fared, my youngster picked up three with a .22 rifle on a four-mile stretch of road. We presented these to a farmer we were visiting for a report: he told us that in his 20 years here he had never known so many hunters in one season, yet at the end of the month there were still ruffed grouse parading the open roads at sunset.

In the fall of 1942, sixty miles north-west of Edmonton, four "gentlemen" had settled down to do a little poaching, thinking they could make money from members of the American forces then stationed here in large numbers by selling them canned ruffed grouse (the sale of game is illegal in Canada). They remained for a week and did not bother to shift camp but in that time they had bottled something over 2,000 birds. The episode is, of course, reprehensible, but the accomplishment itself in relation to grouse numbers is of unusual interest.

Ruffed Grouse

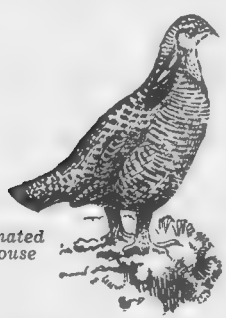
As to Hungarian partridges (see cover) it was possible to count as many as 150 in a single field in the fall of 1942, while pheasants occurred periodically in droves of 50 or 60 or 70: the ganging habit is well developed among pheasants in the Province. Magpies at this time were extremely abundant, several per mile along typical country roads, giving a fair idea of their density. Evening grosbeaks literally festooned the maples on Edmonton streets during the winter months; bluejays were everywhere. The fur-catch, in general, was good.

When rabbit numbers are up, the Canadian north is teeming with life; when the crash hits, the contrast is unbelievable. Wilderness and farmlands alike are then literally lifeless; only when summer recurs with its hosts of migratory fowl and songbirds is there a temporary return to life, but the resident species are missing. In 1943 —the onset of the crash following the peak—rabbits were still to be found in small numbers, chicken could yet be hunted in scattered muskeg areas, ruffed grouse could still be heard drumming here and there, the stubble fields still had a small population of Hun-

garian partridge: one year later, 1944, and even these remnants had disappeared. One could drive for a hundred miles in the winter and see neither gamebird nor rabbit—the countryside was seemingly dead. Even magpies were scarce, the Edmonton grosbeaks were missing and bluejays became temporary rarities.

Thompson Seton, with his remarkable powers of observation and astute critical acumen, gave the first coherent account of the rabbit cycle. He called the ten-year decimation the "plague" but —and as Seton already appeared to realize—it now seems that many diseases rather than one run riot at times of crash and wipe out the superabundant hordes. I do not propose to discuss theories, but the consensus of evidence suggests a deficiency condition rather than an epidemic in the more usual sense. The most complete investigation yet carried out (by Dr. R. G. Green of Minneapolis) lends direct support to this viewpoint. Whatever the answer, death first begins to overtake the rabbits in the fall and hits them on an enormous scale the succeeding spring. Where the animals have been really thick, whole haystacks have been subsequently burned because they have been riddled and befouled through and through with dead rabbits. The few survivors appear to achieve nothing by way of reproduction. The summer merely passes with a host of hawks, owls and other predators, themselves now doomed, taking the final toll. By the end of the next winter decimation is virtually complete; over large tracts of country not a single rabbit remains; often for two, sometimes for three consecutive winters, it is impossible to find even an isolated track. One begins to think that the animals can never come back or restock these denuded districts; even the skeletons, which littered the best areas in hundreds after the crash, have disintegrated and gone. Yet seven or eight years later the miracle has happened: the country is alive again with rabbits.

Much the same story applies to grouse with one interesting difference—the birds leave practically no trace of death behind them: they just disappear, their skeletons rarely found in evidence. This naturally suggests that perhaps they have really migrated, but that viewpoint is open to objection. For instance, tens of thousands of grouse cannot migrate without turning up somewhere else where they must surely be noticed. Such large movements have occurred, and of that we can be sure because the influx *has* been observed. The classical case in Canada is that described by Snyder from northern Ontario at the peak of 1932, when enormous numbers of sharptails invaded southern Ontario and Quebec, but by 1934 all had disap-



Pinnated Grouse

peared again. Similar movements on a smaller scale have taken place also in the west although they have never been put on record. With each rabbit crescendo, for example, small numbers of the true prairie chicken of the United States, the pinnated grouse (*Tympanuchus americanus*), invade certain portions of Alberta (presumably from the east) and for three or four years are conspicuous members of the fauna. When the crash hits, that is the last of them till the next wave of immigration occurs.

Evidence of death, however, is sometimes available, for on rare occasions the skeletons *are* found. Thus I have a record of four dead grouse picked up in early spring in a single small wood-lot of only a few acres. There are two good reasons against the finding of grouse skeletons in large numbers. In the first place, chicken apparently die where discovery of the remains is the least likely, in our muskeg areas or, in the case of the ruffed grouse, in the deep woodlands. Few people go into these places either on business or for pleasure. Secondly, a delicate bird's skeleton is not likely to last even as long as a rabbit's; in short time it has been demolished by mice, insects and weather. The likelihood of finding the skeletal evidence in the case of grouse is, in fact, extremely slim.

By 1945 the first signs of the present recovery were evident. Restricted patches of territory were being repopulated with rabbits; the drumming of ruffed grouse could more frequently be heard; in northern districts flocks of chicken were more occasionally seen; spruce partridge were again showing up in the muskeg areas; the farmlands here and there once more boasted flourishing covies of Hungarians. At present, in the late summer of 1947, the country again begins to look interesting. As one takes a tramp through acres of brush or across meadowland or through poplar woodlands, once more one flushes families of chicken, Hungarians or ruffed grouse, or stumbles across occasional rabbits. They will not be in evidence from the highways till the leaves fall and snow is on the ground, but they are certainly there in greater numbers than for the past five years, evidently on the road to their anticipated recovery.

Grouse and partridges have the advantage of wings: they can move fast and spread themselves with ease. Not so the rabbit, which has to hop its way to new premises and hopping takes time. At the moment a spread is undoubtedly taking place but rabbits are just about at their most patchy, with many here and few there. Only when their numbers have reached a certain level, when the populated centres have expanded like rings on the surface of a lake

till their edges impinge, will they again enjoy a general distribution. The current stage of every cycle conveys the impression that this time the poor little rabbit is really doomed to failure: he seems to take so long before he has achieved that general dissemination that removes all doubt as to his re-establishment. Well, he has never yet defaulted; he will surely again succeed. (There is some evidence that over limited areas rabbits may actually fail to recover and so drop out locally for one complete cycle).

The upland birds, being possessed of wings, do the thing differently. They waste no time colonizing vacant premises and just because at first they spread themselves thin over the land, the initial increase is seldom appreciated. When they approach the peak they commonly move into areas in which permanent establishment seems quite unlikely. Sharptails will move onto the prairies, for example, while Hungarians have, during the past two peaks, gone far into the northern wilderness with practically no chance of survival or permanent colonization, or westwards right into the Rocky Mountains (as far as Banff and Jasper Parks) where the case is equally hopeless for them.

A point of rather particular theoretical interest about these cycles is the disparity in amplitude shown from decade to decade, a feature that applies also to the lynx and is sufficiently conspicuous on the accompanying graph. The 1925 peak, for instance, was a tremendous one with rabbits, grouse and Hungarians all in great abundance, while 1934 produced a relatively low one. The total numbers may be two or three times as great during the one peak as they are during the next. In view of the theory which holds that density of numbers is the factor responsible for instigating the crash, one naturally wants to know why 2,000 rabbits to the square mile should constitute a fatal crowd during one cycle and only 1,000 during the next. The viewpoint is certainly open to debate.

Finally a word about the latest recruits to the cycling fraternity, the Hungarian partridge and the ring-necked pheasant. Both species present unusually interesting cases since both are foreigners imported from abroad.

Hungarians were introduced into Alberta in two small instalments in 1908 and 1909, a total of 180 pairs being liberated in the neighborhood of the city of Calgary, about 200 miles south of Edmonton and nearly 150 miles north of the American border. Two local sportsmen, Fred Green and Austin de B. Winter, were the moving spirits in this enterprise. Both of them have lived to see this greatest success in the annals of gamebird introductions settle into its stride and have witnessed Hungarians adopting the habits and ways of the natives for, like them, and together with them, they now apparently come and go at ten-year intervals. To the kindness

of Mr. Winter, incidentally, I have been constantly indebted for contemporary information on the partridges of southern Alberta.

When planted in the Calgary district, there were at first the usual doubts about survival but these were soon dispelled with the appearance of covies almost everywhere. The birds did so well, in fact, that a first open season was declared as early as 1913, only five years after the initial liberations with a daily bag of 5 and 25 for the season of October and November (if the only record known to me is authentic). Although the point was not appreciated at the time and was entirely a matter of chance, the years 1908 and 1909 were well chosen for they happened to fall into the upswing of a cycle: no better occasion could have been picked. It was an augury of the best.

Gradually the birds spread from the original centres, north, south and east, and west to the adjacent foothills of the Rocky Mountains, the only bar to progress encountered. There are no written records as to what happened to Hungarians during the crash of about 1916, but one may infer that they suffered reduction, for the 1916 season of October and November was, in 1918, cut to October only (the 1917 regulations are missing).

Towards the next peak (1925) the limits showed progressive increases. Grouse were then tremendously plentiful, but so were Hungarians, and yet the fact of a common cycle affecting all species together was not suspected. Looking back at the game regulations, however, there remains no doubt as to the history of the Hungarian partridge at this period. The figures, which I owe to Mr. D. E. Forsland, Provincial Inspector of Game, are as follows:

	Length of Season	Bag Limits
1921	October 1-31	5 per day: season, 25
2	October 1-31	10 per day: season, 50
3	October 1-31	10 per day: season, 50
4	(No Records)	
5	Sept. 16-Nov. 14	15 per day: season, 75
6	Sept 16-Dec. 14	15 per day: season, 75
7	Sept 16-Dec. 14	10 per day: season, 50

The first reduction (1927) following the peak no doubt showed a lag of a year in the regulations as has always been the case after grouse peaks. Fifteen birds per day and 75 for the season is a generous limit, yet at the following peak of 1933, a season bag of 200 was permitted, while in 1942 the figures had risen to 20 per day and 250 for the season.

By 1933, a peak year, Hungarians were again superabundant (as were also grouse and rabbits). In 1934, late in the hunting season, when J. N. McDonald and I were enjoying wonderfully good Hun shooting, we noticed that our sex and age records were revealing an excessive percentage of old birds. Out of some 200 examined, about 70% were, in fact, adults. I promptly issued a questionnaire

to country points and discovered that the rearing season had been accompanied by a heavy rate of juvenile mortality but, by November, post-mortems revealed nothing. It was, however, the onset of the first Hungarian partridge crash ever to be recorded: by 1936, the probable bottom of the depression, one could travel hundreds of miles and see only occasional covies of Hungarians and chickens; rabbits had almost completely disappeared. By 1937 partridges began to show up again in the north. In 1939 hunting was once more good while by 1942, the next peak, Hungarian shooting had reverted to excellent: the whole Edmonton countryside was alive with birds, yet by 1944 they had once again almost disappeared. Today, as already noticed, the current partridge population is fast recovering. The 1944 depression seems to have been more drastic than that of 1936.

Besides game regulations or field observations, the cycle emerges also from dependable shooting records, as in the example herewith. The friend who provided it, a first-class and consistent shot keeps a precise annual record of performance. The shooting was done in the same locality throughout, 50 miles north of Moose Jaw, Saskatchewan and covers the ten years of the last cycle, depression to depression.

Year	Period	Sharp-tails	Hungarians
1937	12 days	25	12
8	do	62	55
9	do	74	50
1940	do	98	96
1	do	72	86
2	do	77	90
3	do	52	91
4	do	21	36
5	do	29	18
6	5 days	5	2

During the high years chicken were so abundant that shooting was restricted to the early morning hours, with the rest of the day devoted to movies. The sender adds: "In 1946 I think there were more chickens than the record indicates, but we had very bad weather".

This adoption of the cycling habit by the Hungarian partridge, an introduced species, is of unusual theoretical interest and seems to suggest a good pointer towards a possible solution of the whole problem.

As to the pheasant, this was first introduced about 1908 (the exact date is uncertain), also in the Calgary district. Unlike the Hungarian, the original 180 pairs of which were ultimately destined to stock the three prairie provinces as well as parts of Montana and North Dakota, pheasant plantings did not take, even though pheasants were subsequently turned down over a span of 30 years in thousands. Some of us, in the middle thirties, were trying to induce

the Game Leagues and the Game Department to sanction an open season on cock birds in the belief that a reduced cock ratio might turn the trick. The then Commissioner, Mr. W. H. Wallace, a native of Scotland conversant with old-country pheasant practice, was himself sympathetic. In 1939 the suggestion was adopted. Apparently it worked, for there has since been an open season annually, while the Brooks area of southern Alberta (Eastern Irrigation District) now affords some of the best pheasant shooting on the Continent.

What effect previous peaks and depressions may have had on the pheasants of Alberta it is impossible to say, for the population has been so sparse that the thing would in any case probably have escaped notice even had we known as much about it then as now and anticipated the contingency. Immediate interest thus centres on the last peak. There is no doubt, I think, that 1942 witnessed the heaviest population of pheasants in the history of the Province: practically throughout the districts in which the species occurred, good shooting was obtainable. Since then there has been a general drop in numbers with the minimum possibly reached in 1946. This low, however, is not unique to Alberta but extends over the entire Continent, analogous with typical grouse and rabbit minima. It may be assumed that the passage of time will reveal the status of our pheasant population in the perspective of the ten-year cycle, but at present we can only speculate: we do not yet know the answer.

The ups and downs of animal numbers depend on what is technically known as the "interaction of biotic potential and environmental resistance." Animals normally reproduce at a certain level. If environmental factors are such as to permit a higher-than-average rate of survival, the numbers promptly rise; if unfavorable, they drop, and the drop may be severe. Thus, in 1932, the egg production of the Cape Cod mackerel was estimated at 64,000 *billion* eggs.

Owing to the fortuitous circumstance that northerly gales drifted these pelagic ova southwards into a zone in which the sea temperature was high enough to prove disastrous, the survival rate dropped to about five eggs per million, or 0.0005%, with drastic effects on that particular year-class and the catch of subsequent years. The opposite has also happened, as in California in 1926 when, supposedly due to a poisoning campaign and removal of normal predation, mice spread out from Buena Vista Lake to surrounding country till they could only be estimated in billions. Some hundreds of *tons* of mice were subsequently destroyed.

Both the above are exceptional examples, but the ten-year cycle of Canadian birds and animals is anything but exceptional, for it recurs with almost clockwork dependability. It is, moreover, known to have occurred for the past 200 years. That a phenomenon of such stupendous scale might ever be harnessed and got under control may be a case of wishful thinking but, largely on account of its very vastness, it presents a scientific conundrum of fascinating appeal. It must be considered essentially a problem of high latitudes, already less obvious in southern Canada itself and only to be detected with some difficulty in the United States. Nor is it confined to the *Canadian* North. At this moment, for instance, the capercaillie and black-cock (both are grouse) of Scandinavia and Finland are recovering from a similar crash that decimated their ranks also in 1943 and 1944.

The question is often asked—Why don't the myriad rabbits of Australia cycle? Part of the answer at least may lie in the simple fact that Australia falls wholly within 40 degrees of the equator, while all of Canada is situated beyond the 49th Parallel. Could the entire continent of Australia be shifted 20 or 30 degrees further south (i.e., towards the pole and away from the equator) an Australian rabbit cycle might actually become a reasonable expectation.

Since 1905, when Alberta became a Province, and provincial game laws were first established, at ten-year intervals there have been closed seasons on grouse and some of the fur-bearers. To both the fur trade and sportsmen this periodicity has proved a disturbing element; to the biologist it presents one of the most mysterious problems in the field of conservation. In its sheer magnitude it offers a challenge to science that has few peers in the realms of wildlife. Let us hope that the interest of governments, Dominion and Provincial alike, may some day be sufficiently aroused to institute an organized attempt to find the answer.